Department of Health and Environmental Sciences
STATE OF MONTANA HELENA, MONTANA 59601

John S. Anderson M.D.
DIRECTOR

August 16, 1973

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Dale Burk, The Missoulian, Missoula, MT 59801
The Montana Standard, Butte, Montana 59701
The Great Falls Tribune, Great Falls, MT 59401
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Department of Fish and Game, Mitchell Building, Helena, MT 59601
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Dorothy Bradley, Route 3, Box 114, Bozeman, MT 59715
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George Darrow, Midland National Bank Building, Billings, MT 59101
Skyline Sportsmen's Club, Box 173, Butte, MT 59701
Jay Rooney, Elliston, MT 59728

Ladies and Gentlemen:

The attached impact statement is submitted for your consideration. Comments should be sent to me within 30 days 9/16/73 following the above date. A 15-day extension of the comment period may be granted if necessary.

Sincerely,

Daniel Vichorek

Daniel Vichorek
Technical Writer

DV:mrc

[redacted]

FORWARD

This draft environmental impact statement is submitted pursuant to the Montana Environmental Policy Act, (MEPA) Section 69-6504 (b)(3). The statement was prepared by the Environmental Sciences Division of the Montana State Department of Health and Environmental Sciences, regarding a proposed hydrometallurgical operation using the Arbiter reduction process, which would be built near Anaconda. The Anaconda Company has applied to the Air Quality Bureau for a permit to build the portion of the plant that might be capable of emitting air contaminants.

To date, research by this department has indicated that operation of the proposed plant would not result in illegal air pollution and could instead lead to improved air quality in the Anaconda area. The improvement in air quality would result when the Arbiter plant began accepting some of the high sulfur copper concentrate that causes high SO_2 emissions when processed through the old smelter.

Because the Air Quality Bureau would be the first agency to issue a permit for the new operation, it was designated as the lead agency under MEPA and was responsible for preparation of this statement, although water pollution from the plant is more likely than air pollution.

Although MEPA requires the lead agency to consider all significant impacts that could result from the approval of this plant, the permit already requested by the Anaconda Company could only be denied if it appeared that illegal air pollution would occur as a result of approval.

As no significant air pollution is expected to result from this plant, the Air Quality Bureau will issue the requested permit after the 60-day waiting period that must follow issuance of this statement, unless comment from the public introduces serious questions that would have to be dealt with in a final impact statement.

Agencies and individuals with information or comments regarding impacts of any type that could result from this plant should notify the Air Quality Bureau within 30 days so that these concerns may be resolved.

Under the Montana Water Pollution Control Act, a waste discharge permit is required before a discharge is made to a surface water stream.

Although a significant concentration of pollutants would be discharged into the Anaconda pond system from the plant, the total amount discharged is not expected to increase above present discharge levels.

I. DESCRIPTION OF PROPOSED OPERATION

Plant and Process

Information submitted by the Anaconda Company indicates the proposed Arbiter plant would process up to 560 tons of copper flotation concentrate produced at Butte to yield as much as 100 tons daily of copper metal.

The copper concentrate contains 26% copper and 32% sulfur and is primarily a chalcocite (Cu2S) with varying quantities of other copper, zinc and arsenic containing minerals. Large quantities of pyrite also are present.

The concentrate would come to the new plant as a slurry through a pipeline which would originate at an existing rail car unloading and pumping facility near the present pyrometallurgical smelter, which is about a mile from the site of the proposed Arbiter plant. The incoming slurry is approximately 60 to 70 percent solids.

Upon its arrival at the Arbiter site, the slurry would be stored in a 24-hour holding tank. It would then be diluted with a recycled process liquor and leached in agitated pressure vessels in the presence of gaseous oxygen and ammonia. In the Arbiter process, the copper sulfide minerals are broken down and the copper is solubilized as a copper amine sulfate. Pyrite is not affected. The reaction is carried out at moderate temperatures and pressures and the leach reactors must be cooled to maintain optimum conditions. There are three parallel trains of leach reactors, each with five reactors. A small fraction of inert gases is generated in the process, and is continuously bled to the ammonia scrubbing system.

The slurry, now containing solubilized copper and the remaining solid materials, passes to a series of four counter current decantation (CCd) thickeners where makeup water and recycled liquor called raffinate, washes the copper bearing solution away from the leach residue solids. Each of the four thickeners is 85 feet in diameter and will operate with underflow solids in the range of 55 percent. The first two CCD thickeners will be covered and vented for recovery of any ammonia fumes. Pregnant copper bearing solution from the thickeners is pumped to a clarification circuit. Underflow

leach residue solids from the CCD thickeners are pumped to a flotation circuit for recovery of silver and unleached copper values.

In the flotation circuit, the residue is repulped with water, and conditioned with zanthate, lime and frother (methyl iso-butyl carbinol) to float the silver values and some undissolved copper sulfides. The flotation concentrate is thickened and pumped back to the existing Anaconda smelter operations on an intermittent basis. The tailings from the flotation circuit are combined with gypsum discharged from the ammonia recovery circuit and pumped to a contained tailings reservoir.

In the clarification circuit, the pregnant ammoniacal solution from the flotation circuit is processed through vacuum pre-coat filters to remove the remaining solids.

The filtered pregnant solution, in the next step, passes to the liquid ion exchange, or solvent extraction process. Here the solution is contacted countercurrently in two mixer-settler stages with an organic solvent, which removes the copper content from the ammoniacal solution. The solvent, which consists of 30 percent General Mills LIX 65N in a high flashpoint distillate, reduces copper content in the ammoniacal solution from 30 grams per liter (g/l) to less than ten parts per million (ppm). The copper free ammoniacal solution returns to the leach and thickener circuits and a portion discards to the ammonia recovery section to prevent buildup of sulfate levels in the solution. Through this discharge the sulfur in the original concentrate is eventually disposed of as gypsum.

The solvent solution now bearing the copper passes to three mixer-settler stages where it is contacted countercurrently with spent electrolyte, which contains approximately 25 g/l copper as sulphate and 130 g/l of free sulfuric acid. The copper is stripped from the organic solvent and enriches the electrolyte to 40 g/l of copper with 110 g/l acid remaining. This strong electrolyte is pumped to electrowinning and the solvent is recycled to pick up more copper from the ammoniacal solution.

In the electrowinning tank house 100T/D of copper is plated out of the strong

electrolyte as metalled cathode copper. The clarified electrolyte from the mixer-settler stages enters in the head tank of the first set of 80 electrowinning cells. Overflow from this tank feeds the second set of cells. From the head tank 100 gpm flows by gravity to each cell. Cell overflows drain to collection tanks. Copper is plated out of solution and the copper content of the electrolyte is reduced from 40 g/1 to 25 g/1.

Each set of 80 cells has its own rectifier unit and three circulating pumps to transfer the electrolyte from each collection tank through the head tank and back to the electrowinning cells. The spent electrolyte at 25 g.p.l. Cu returns to the LIX section where it is again used to strip copper from the organic. A small amount of electrolyte is neutralized and bled from the system to maintain an impurity balance.

Another important operation in the plant is the ammonia recovery section, which receives about 150 GPM of ammonium sulfate solutions containing a small amount of sulfamate (NH_2SO_3) and variable quantities of zinc resulting from the oxidation, during leaching, of a part of the zinc mineral contained in the concentrates. The important reactions carried out in this section of the plant are sulfamate hydrolysis and the precipitation of $CaSO_4$ resulting from the reaction between lime and ammonium sulfate. The sulfamate is hydrolydized to ammonium sulfate rapidly at temperatures above 450°F.

Because of the heat given off in the process, a cooling tower is required. After hydrolysis, the solutions are mixed with milk of lime in two trains of four boil pots. The reaction produces free ammonia in solution and large quantities of steam are required to spring it into the vapor stream. The ammonia stream mixture flows to a fractionating tower where the ammonia is concentrated for recycling to the leach vessels. The $CaSO_4$ slurry produced will contain about 0.2 g.p.l free ammonia. This slurry is diluted and cooled to enhance formation of gypsum and mixed with flotation tailings to make up the single residue discard stream from the plant.

Auxilliary Equipment

A. The ammonia vent system

All equipment associated with strong ammoniacal solution will be covered and

vented to the ammonia vent system. The entire vent system will be operated at a slight negative pressure and all vent gases will be collected and passed through a single scrubbing tower. This tower will be 4½ feet in diameter and 55 feet tall, packed with polypropylene Intalox saddles. Ammonia is removed from the vent streams by intimate contact with fresh cold water. Design efficiency is in excess of 99.9 percent with an entering water temperature of below ambient temperature.

B. The oxygen plant

Oxygen would be generated in a standard cryogenic plant designed, operated, and built by the Linde Division of the Union Carbide Corporation. The plant could produce up to 115 tons per day of oxygen gas at 40 psi and 5 tons per day of liquid oxygen. The air compressor for this unit would be driven by a 3000 HP motor.

C. The boiler plant

There would be three large boilers each capable of producing up to 90,000 pounds per hour of 125 pound steam. Two smaller boilers for the hydrolysis vessel could each produce 6000 pounds per hour of dry and saturated steam at 850 psi. Two of the large and one of the small boilers would be operating at any one time, with the others for standby.

All boilers are designed for operation with natural gas, but could burn No. 2 fuel oil if necessary. The boilers would use an estimated 5 million cubic feet of gas per day.

D. The anode casting plant

The casting plant would be designed to cast the complete inventory of 8000 lead anodes in 60 working days. Life of the anodes is expected to be two to five years, so the plant would be used infrequently. Lead processing will be at low temperatures to avoid emission of lead fumes.

Figures 1 and 2 offer graphic representations of the plant site and operation.

Water Supply and Disposal System

Approximately 3.7 to 5 million gallons of water per day will be used for cooling, with another million gallons used for tailings slurry. The tailings slurry would be

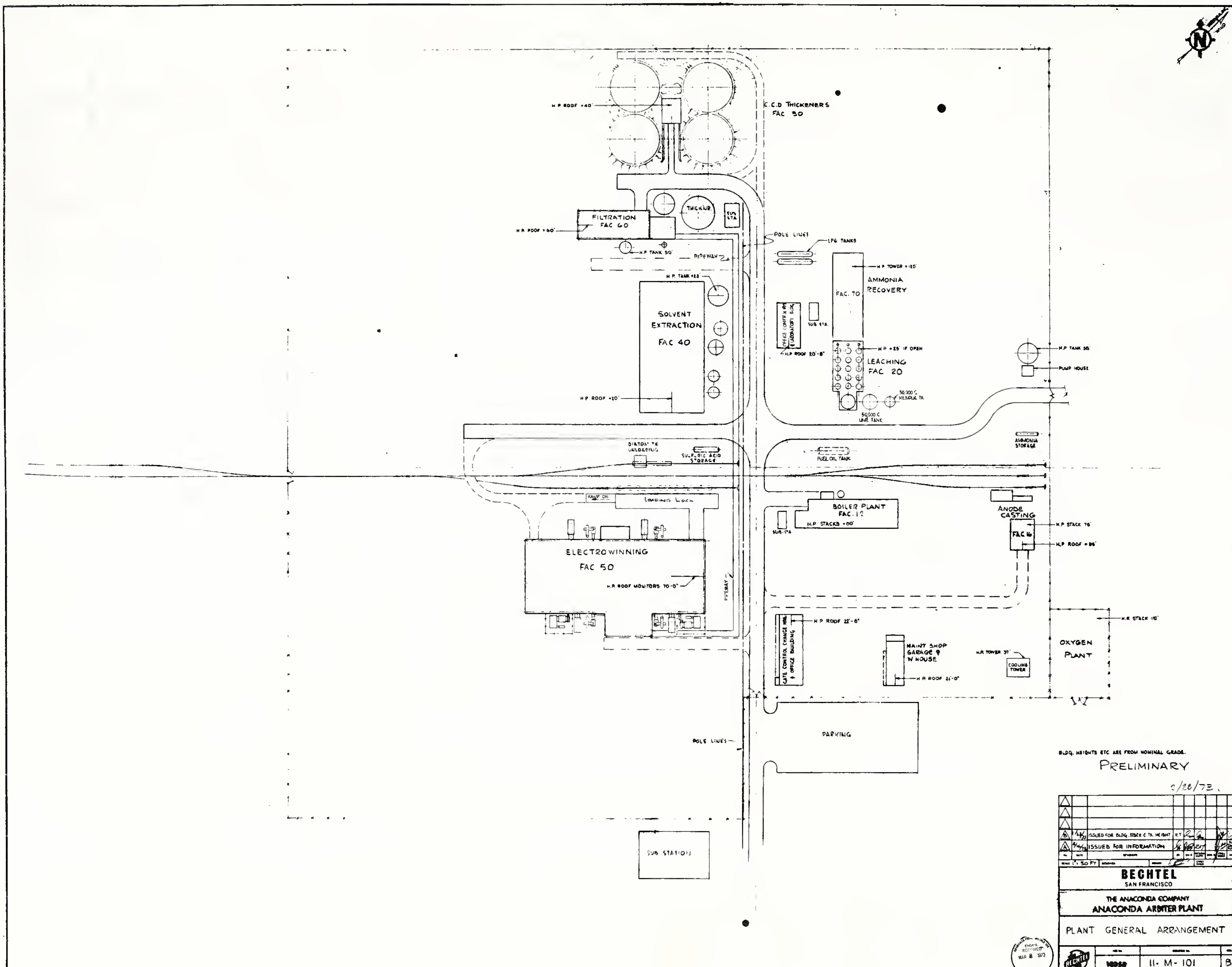
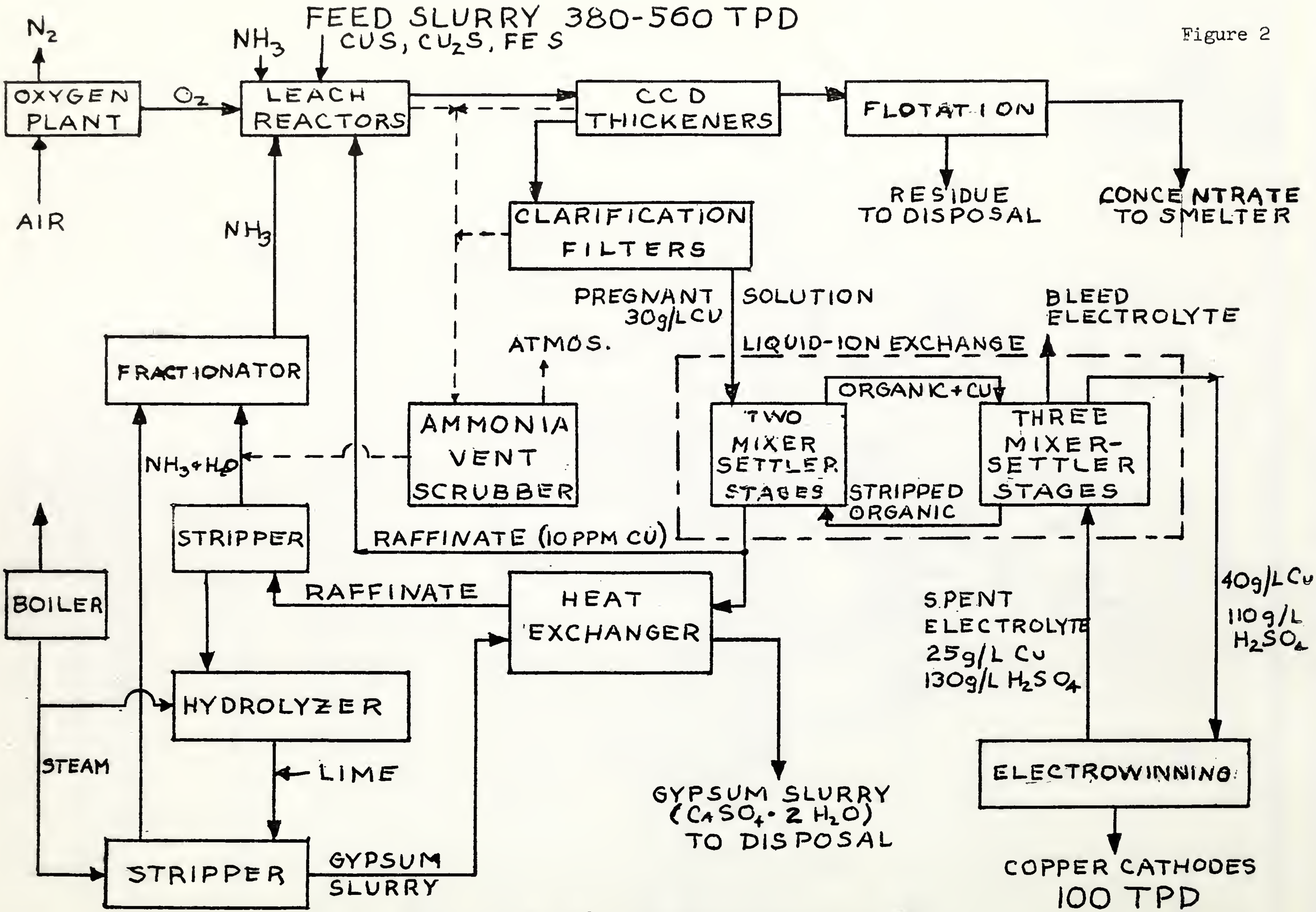

C.C.D THICKENERS FAC 30
H.P. ROOF +40'
FILTRATION FAC 60
H.P. ROOF +60'
THICKNR.
SUB STA.
POLE LINES
LPG TANKS
H.P. TANK 50'
PIPEWAY
H.P. TOWER +110'
AMMONIA RECOVERY
FAC. 70
H.P. TANK +28'
SOLVENT EXTRACTION FAC 40
OFFICE CONTR. & PB LABORATORY BLDG.
SUB. STA.
H.P. ROOF 20'-8"
H.P. +25' IF OPEN
LEACHING FAC 20
50,000 G LIME TANK
H.P. TANK 58
PUMP HOUSE
H.P. ROOF +20'
AMMONIA STORAGE
DIATOM. TK UNLOADING
SULFURIC ACID STORAGE
FUEL OIL TANK
LOADING LOCK
RAMP DN
BOILER PLANT FAC. 12
H.P. STACKS +60'
SUB-STA.
ANODE CASTING
FAC 16
H.P. STACK 76'
H.P. ROOF +35'
ELECTROWINNING FAC 50
H.P. ROOF MONITORS 70'-0"
PIPEWAY
GATE CONTROL CHANGE HSE. & OFFICE BUILDING
H.P. ROOF 22'-6"
MAINT SHOP GARAGE & W HOUSE
H.P. ROOF 21'-0"
H.P. TOWER 37'
COOLING TOWER
OXYGEN PLANT
H.P. STACK 110'
PARKING
POLE LINES
SUB STATION
BLDG. HEIGHTS ETC ARE FROM NOMINAL GRADE.
PRELIMINARY
2/20/73
ISSUED FOR BLDG. STACK & TK. HEIGHT
ISSUED FOR INFORMATION
1" = 50 FT
BECHTEL
SAN FRANCISCO
THE ANACONDA COMPANY
ANACONDA ARBITER PLANT
PLANT GENERAL ARRANGEMENT
11-M-101
B
RECEIVED MAR 8 1973

Figure 1

Figure 2



BLOCK FLOW DIAGRAM

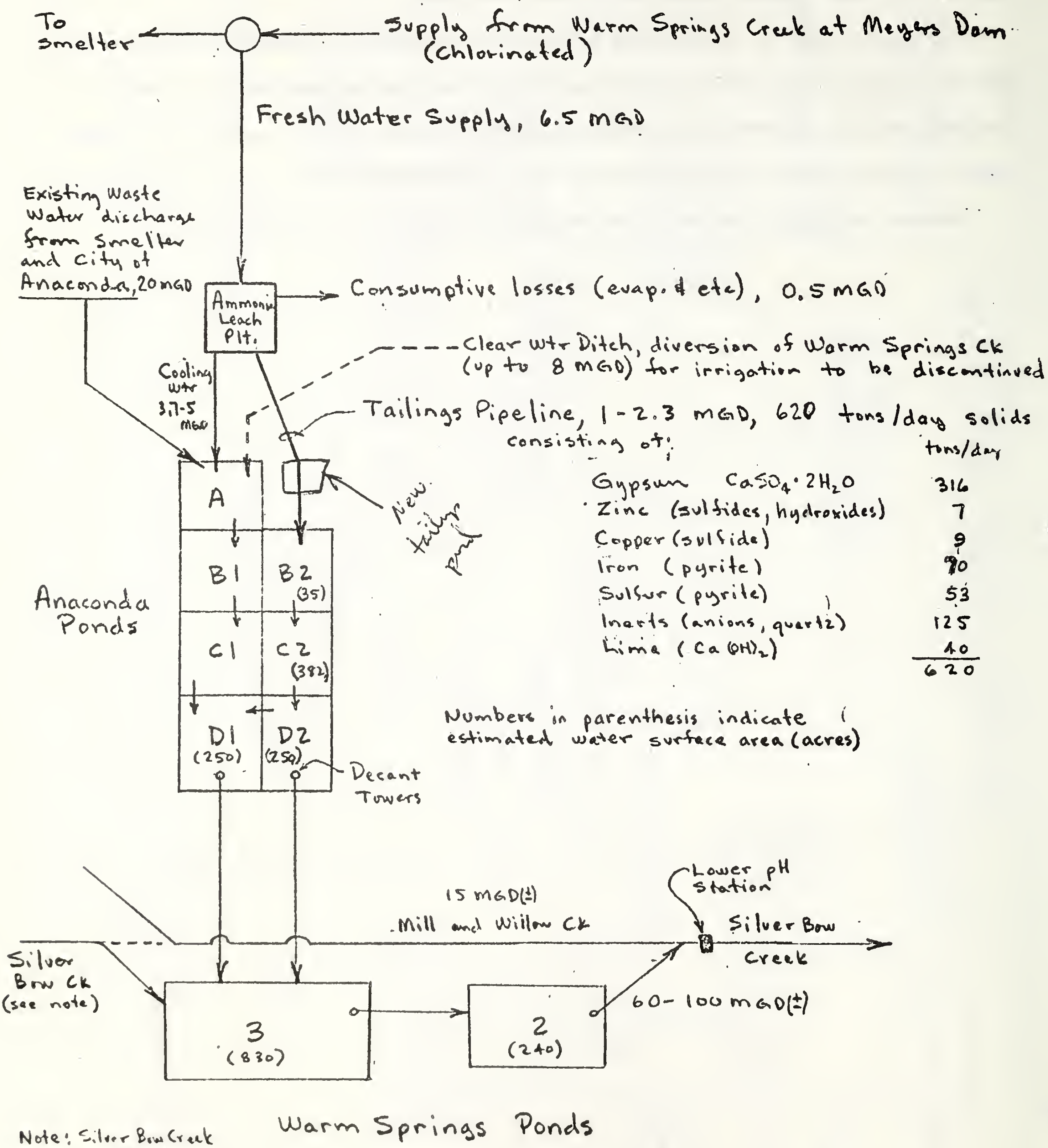
discharged into a new settling pond that would be built near the plant site. Discharge from this pond would flow first into the existing pond B2, then in sequence into C2, D2, (and/or D1), Warm Springs Ponds, and Silver Bow Creek.

The primary use of the existing ponds has been tailings disposal, to the extent that the 4200 acres of ponds is more than 60 percent full of tailings. A network of diversion ditches conveys water from the existing smelter and the Anaconda City sewer system for dust control and revegetation on the ponds partially filled with tailings.

Further information on the water system is available in Figures 3 and 4.

THE ANACONDA COMPANY
ENVIRONMENTAL ENGINEERING DEPARTMENT

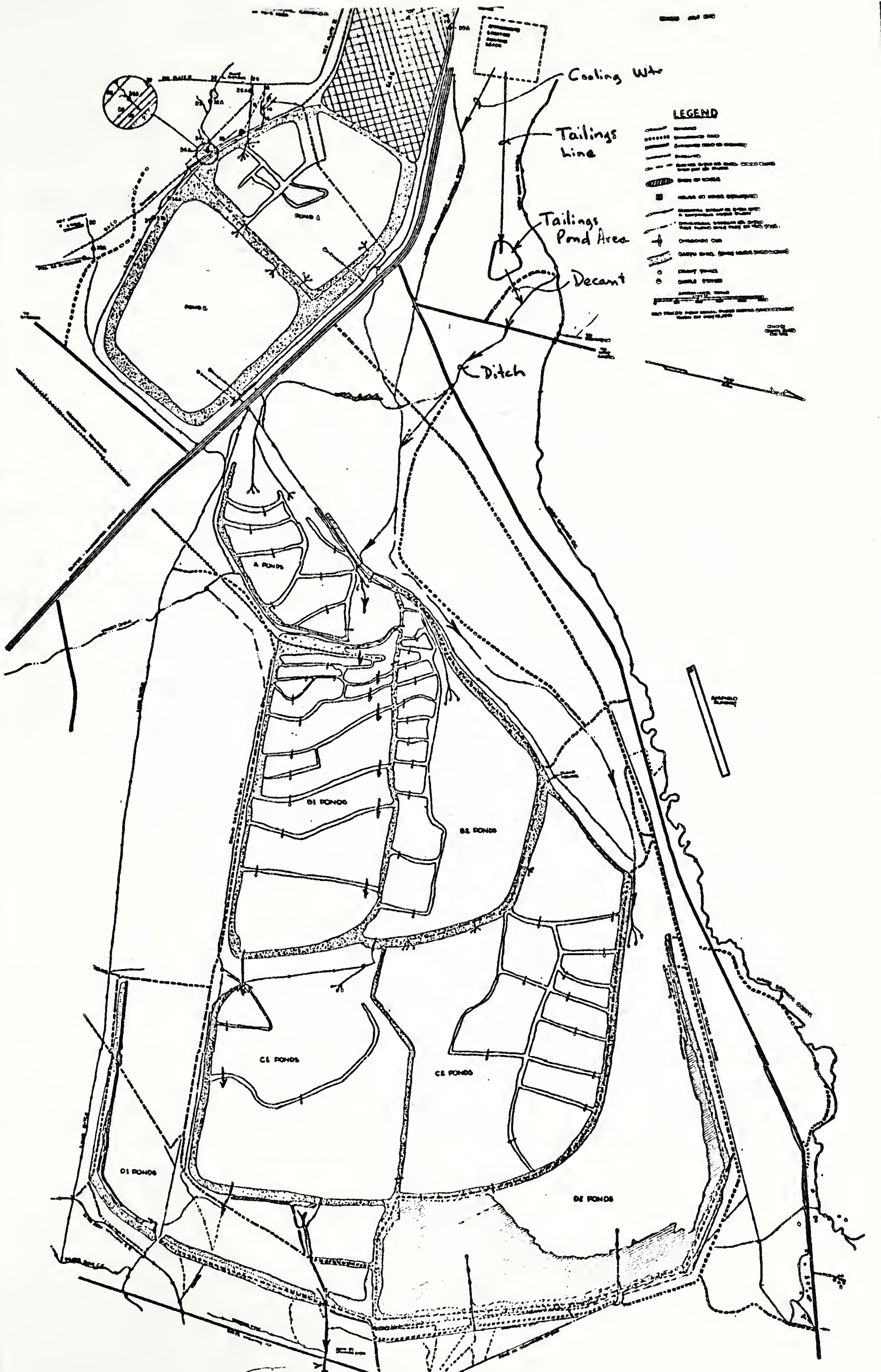
DATE 5/4/73 SUBJECT Estimated Wtr Balance PLANT Ammonia Leach
REMARKS & Solids Disposal BY GMc FILE



Note: Silver Bow Creek will not be diverted to Warm Springs Ponds when quality becomes suitable.

Figure 3

Schematic Diagram



Cooling Wtr
Tailings Line
Tailings Pond Area
Decant
Ditch
LEGEND
POND 3
POND 2
A PONDS
B1 PONDS
B2 PONDS
C1 PONDS
C2 PONDS
D1 PONDS
D2 PONDS
To Warm Springs Ponds

Figure 4

Air

The exact concentrations of air pollutants are difficult to predict, as the Arbiter process is new and untried except at the pilot plant stage. However, based on the operation of the company's pilot plant in Tuscon, it appears that airborne emission concentrations will be insignificant.

Sulfuric acid mist generated in the electrowinning process probably would be the only emission noticeable, even within the plant. Building ventilation would be designed to dilute in-plant concentrations below one mg/m^3. Atmospheric concentrations would be still less, falling well within Montana's standard of 4 ug/m^3 for an annual average according to preliminary calculations. Four discharge stacks in the roof would exhaust the building ventilation to the atmosphere.

Fuel oil purchased to operate the boilers would be low enough in sulfur content to guarantee that emissions would meet state standards. Other emissions are noted in Figures 5, 6 and 7, as compared to the emissions from the existing smelter, Figure 8.

Copper concentrates known to be high in sulfur would be diverted from the existing smelter to the Arbiter plant, resulting in a reduction of 300 tons per day of sulfur dioxide emission from the smelter. There is no SO_2 emission from the Arbiter process except for an insignificant amount generated by the boiler fires.

Water

There is a potential for water pollution, although proper operation of the plant and pond system should minimize the chances of any further pollution of Silver Bow Creek or the Clark Fork River.

An estimated 620 tons of solids per day would be discharged into the new pond in the tailings slurry. This material is broken down as follows:

ANACONDA REDUCTION WORKS, ANACONDA, MONTANA

TABLE A

A No.	B Description of Emission Point	C Height of Emission Above Ground Level (feet)	D Type of Emissions	E Quantity of Emissions in #/hour	F Type of Control Facility Installed	G Emissions from Control Facility in #/hour	H Efficiency of Control Facility in %	I Emission Allowable (#/hour)	J Cost of Control Facility (millions of dollars)	K When * Installed
	HYDROMETALLURGICAL OPERATIONS (ARBITER PLANT)									
1.	Ammonia scrubber stack	120	NH_3	900	Wet scrubber	< 9	≥ 99%	----	----*	10/74
2.	Electrowinning tank house stacks	100	H_2SO_4	<0.75	Tall stacks (4)	< 0.75	0	----	----	10/74
3.	Oxygen plant vent stack	30	N_2	41,700	Stack (conventional plant)	41,700	0	----	----	10/74
4.	Cooling tower	37	H_2O	100,000 (200 gpm evaporative and wind loss)	----	----	0	----	----	10/74
5.	Boiler stacks (3 boilers @ 90,000 lbs. steam/hour 2 operational, 1 standby)	80		(total 2 boilers)	Tall stack	Same as E	0	Reg. 90-006 65.4 lbs/hr. particulates total	----	10/74
			(If operated with natural gas:)							
			CO_2	25,470						
			H_2O	19,600						
			N_2	135,300						
			O_2	5,270						
			CO	7						
			NO_x	40						
			SO_2	0						
			particulates	2						
			(If operated with diesel #2 fuel:)							
			CO_2	32,340						
			H_2O	14,140						
			N_2	135,300						
			O_2	5,470						
			CO	68						
			NO_x	60						
			SO_2	6						
			particulates	6						

*SEE NOTES IN TEXT

Figure 5

ANACONDA REDUCTION WORKS, ANACONDA, MONTANA
TABLE A

A	B	C	D	E	F	G	H	I	J	K
No.	Description of Emission Point	Height of Emission Above Ground Level	Type of Emissions	Quantity of Emissions in #/hour	Type of Control Facility Installed	Emissions from Control Facility in #/hour	Efficiency of Control Facility in %	Emission Allowable	Cost of Control Facility	When* Installed
		(feet)						(#/hour)	(millions of dollars)	
6.	Boiler stacks (2 boilers @ 7000 lbs. steam/hour, 1 operational, 1 standby)	50			Tall stack	Same as E.	0	Reg.90-006 5.4 #/hr. particulates	---- *	10/74
			(If operated with natural gas:)							
			CO_2	1134						
			H_2O	864						
			N_2	6030						
			O_2	234						
			CO	0.3						
			NO_x	4						
			SO_2	0						
			particulates	0.09						
			(If operated with diesel #2 fuel:)							
			CO_2	1440						
			H_2O	630						
			N_2	6030						
			O_2	243						
			CO	3.2						
			NO_x	6						
			SO_2	0.3						
			particulates	0.45						
7.	Anode drying,* melting, and casting stack	75	particulates	20.8	Baghouse	0.10	99.5%	Reg.90-004 6.0	----	6/74

* SEE NOTES IN TEXT

Figure 6

ANACONDA REDUCTION WORKS, ANACONDA, MONTANA

TABLE A

A	B	C	D	E	F	G	H	I	J	K
No.	Description of Emission Point	Height of Emission Above Ground Level (feet)	Type of Emissions	Quantity of Emissions in #/hour	Type of Control Facility Installed	Emissions from Control Facility in #/hour	Efficiency of Control Facility in %	Emission Allowable (#/hour)	Cost of Control Facility (millions of dollars)	When* Installed
8.	Anode drying,* melting, and casting stack	75	Combustion products from natural gas		Tall Stack	Same as E.	0	----	---- *	6/74
			CO_2	480						
			H_2O	370						
			N_2	2550						
			O_2	99						
			CO	0.14						
			NO_x	0.76						
			SO_2	0						
			particulates	0.03						
9.	Powered roof* exhausts - anode area (2)	35	Building air	2000 acfm each of 2	Roof exhauster	2000 acfm each of 2	0	----	----	6/74
									2.5 * estimated total emissions control cost	

* SEE NOTES IN TEXT

Figure

ANACONDA REDUCTION WORKS, ANACONDA, MONTANA

TABLE A

No.	B Description of Emission Point	C Height of Emission Above Ground Level (feet)	D Type of Emissions	E Quantity of Emissions in #/hour	F Type of Control Facility Installed	G Emissions from Control Facility in #/hour	H Efficiency of Control Facility in %	I Emission Allowable (#/hour)	J Cost of Control Facility (millions of dollars)	K When * Installed
					PYROMETTALURGICAL OPERATIONS					
1.	Main stack	585	SO_2	60,000 (as of 10/74)	Tall stack	60,000	0	Reg. 90-008	---- *	1914
2.	Converter roof	100	SO_2	62,000	Water cooled hoods and new flue	620	99%	Reg. 90-008	6.0 *	6/73
3.	Acid plant stack	175	SO_2	33,400	Acid plant and tall stack	370	98.9% *	----	6.6 *	6/73

* SEE NOTES IN TEXT

Figure 8

Gypsum ($CaSO_4 - 2H_2O$)	316 tons/day
Zinc (Sulfides, hydroxides)	7
Copper (Sulfide)	9
Iron (Pyrite)	70
Sulfur (Pyrite)	70
Inerts (anions, quartz)	53
Lime ($Ca(OH)_2$)	125

Discharge from the pond is estimated as follows:

Calcium	8,000 pounds/day
Sulfates	10,000
Copper	2.7
Zinc	1.6
Nitrogen	1,200 (maximum)

Of the nitrogenous material, 400 pounds per day is sulfamate, 750 is ammonia, and 50 is ammonium. The actual reduction of nitrogen through the pond cannot be accurately assessed at this time. If the overflow water from the pond is high in nitrogen, it can be used for irrigation on vegetated areas.

It is not currently known if biological treatment systems for nitrogenous solutions are feasible for this operation. If such an operation is feasible, it would cost more than $1 million to build and $50,000 yearly to operate. (Ref: Cost of Conventional and Advanced Treatment of Wastewater, Robert Smith, September, 1968, WPCF)

Because of a new water conservation program at the existing smelter, the liquid discharge from that plant will be reduced. By the time the Arbiter plant goes on line, the additional discharge from the new plant will be less than the reduction in discharge from the old plant, resulting in a net decrease in discharge of copper, calcium, sulfate and zinc to Silver Bow Creek.

Currently, water from the Anaconda works, along with the Anaconda city sewage, is discharged from the main Anaconda Company pond system to the larger Warm Springs ponds prior to being discharged into Silver Bow Creek. A water recycling program at the Anaconda works in Butte, plus a program to treat all waste water discharged into Silver Bow Creek at Butte, may soon make it possible to abandon the Warm Springs ponds.

The ponds will be abandoned as soon as metals in Silver Bow Creek can be reduced to acceptable levels. The pick-up of metals from the stream bottom prohibits abandoning the ponds now. A study funded by the Anaconda Company and the State Department of Health and Environmental Sciences and performed by the Montana School of Mineral Science and Technology should soon determine the effects of the tailings deposited in the stream channel over the years.

Abandonment of the Warm Springs ponds should lead to improvement of water quality in the downstream portion of Silver Bow Creek and the Clark Fork River.

When the wind blows, the water in the large Warm Springs ponds is agitated and the minerals on the bottom become suspended. When the wind continues for more than a one-day period, effluent containing more minerals than desirable may be released.

The Clark Fork River from the confluence with Warm Springs Creek to the Little Blackfoot River is classified as $C\text{-}D_2$ by the state, which means the waters shall be maintained suitable for bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply.

The most recent results from the U. S. Geological Service sampling station are shown on the next page. Metal analysis results are not yet available for this date. Metal concentrations for April 18, 1972, are shown and should be about the same for this time period. The present classification should be met except with the possible exception of an extended windy period.

The classification of the Clark Fork River below Garrison is $B\text{-}D_1$ which means the waters shall be maintained suitable for drinking, culinary and food processing purposes after adequate treatment equal to coagulation, sedimentation, filtration, disinfection, and any additional treatment necessary to remove naturally present

impurities; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply.

Again, this classification should be met from the fishery standpoint except possibly during an extended windy period. The drinking water standard for sulfates (250 mg/l) is exceeded at times because of the Anaconda Company operations at Butte and Anaconda. There is presently no public drinking water supply on the Clark Fork River in Montana so this is presently of minor consequence. Substantial reduction of sulfates has already been accomplished with the new treatment and increased recycling at Butte. An additional reduction can be excpected with the additional recycling planned at the Anaconda operation at Anaconda.

Monitoring of the Warm Springs ponds discharge and Silver BowCreek above Warm Springs Creek is performed by the Anaconda Company. Analysis information is provided to the Department of Health on flow, pH, turbidity, suspended solids, alkalinity, calcium, magnesium, sulfates, copper, iron, zinc, lead, cadmium, arsenic, and mercury. In addition to this information, monitoring of nitrogen in various forms will be required on both the Anaconda ponds and Warm Springs ponds discharges. The sampling for nitrogen compounds should begin before the ammonia leach system is placed into operation.

<u>Clark Fork River near Galen on April 19, 1973</u>

Stream Flow	99 cfs
Water Temperature	7.0°C
pH	8.3
Dissolved Oxygen	10.6 mg/l
Biochemical oxygen Demand	3.5 mg/l
Phosphorous (total)	0.04 mg/l
Nitrate and Nitrite total as N	0.29 mg/l
Nitrogen total as N	0.94 mg/l
Calcium	150
Magnesium	18
Sodium	16
Chloride	8.1
Fluoride	1.3
Sulfate	380
Coliform Bacteria	10/100 ml.
Fecal Coliform	0.100 ml.

April 18, 1972

Stream Flow	221 cfs
Arsenic	0.010 mg/l (total)
Cadmium	0.004 " "
Copper	0.020 " "
Iron	0.670 " "
Lead	0.012 " "
Zinc	0.230 " "

Bioassays using fish are planned to assure that adequate treatment and control are provided by the proposed system and to assist in the determination of necessary adjustments or modifications to the control system.

At present, the proposed plan to prevent further liquid emissions from the new plant appears as good as any proven system.

Biological treatment of solutions containing sulfates and various nitrogenous compounds using mechanical equipment such as activated sludge (as opposed to lagoons) is in the development stage in the industry and is not considered a suitable alternate at this time.

The costs for removal of sulfates from solution are very high. To treat the million gallons a day from this plant to reduce sulfates to 100 mg/l through the reverse osmosis process would require an initial capital outlay of $1.8 million dollars, and $1000 daily to operate. (Ref: Engineering Economic Study of Mine Drainage Control Techniques, by Cyrus W. Rice, 1969).

The Anaconda Company is designing a well system for monitoring ground water quality and water table changes in the pond area.

The cooling water to be discharged into the pond system will be at approximately 76°F. The ponds would reduce the temperature to the ambient before discharge into Silver Bow Creek.

III. TOPOGRAPHY AND SOILS

The plant would be located in a flat area about one mile north of the existing smelter and 1000 feet south of Warm Springs Creek. The land was unused before it was graded slightly to accommodate the plant.

IV. IMPACTS

If there are any impacts on the environment, they probably would be minor. The Anaconda area already has been heavily affected by industrial activity. Visual pollution therefore probably would not be a consideration.

Air quality in Anaconda should be improved through the 300 ton per day reduction in sulfur dioxide emissions from the existing smelter. Other emissions from the plant into the air are not considered significant, and no state pollution standards would be approached by the plant if engineering predictions of its performance are accurate.

The chance of a decrease in water quality resulting from the plant also seem remote. If it appears that state water pollution standards would be violated by the plant, treatment facilities could be required, no matter how costly to the Anaconda Company and ultimately to the consumer.

V. ALTERNATIVES AVAILABLE TO THIS DEPARTMENT

1. Require water treatment facilities. This does not seem warranted at this time.

2. Require cooling towers. The pond system would be far more than adequate to cool the water to the ambient temperature before discharge.

3. Require a scrubber on the electrowinning cells. This would be extremely expensive because all the air in the building would have to be funneled through the scrubber. It would be required, nevertheless, if acid mist standards were violated.

As none of the above requirements appears necessary to prevent violation of pollution laws, the plant appears eligible to receive the permit applied for.

VI. SHORT-TERM LONG-TERM COMPARISONS

Industrialized society requires huge amounts of copper. To get the required amount of the metal, serious damage is done to the environment, by mines, smelters, and the various appurtenances and emissions thereof.

However, it is now widely believed that the traditional pyrometallurgical smelting operations are obsolescent and will be replaced by systems far less damaging to the environment, such as the Arbiter process. Presumably, when the Arbiter process is proven commercially feasible, its low air emissions will augur a better quality of life for residents of copper smelter towns around the world.

New systems such as the Arbiter process should make it possible to reduce impacts on the environment while accelerating the production of copper for the economy.

VII. IRREVERSIBLE COMMITMENT OF RESOURCES

Approximately .5 million gallons of water would be lost to evaporation. Probably much of this would be lost through evaporation in the irrigation and dust control processes even if the plant were not built.

Accelerated production of copper presumably will require accelerated mining activity in the open pit mine at Butte, which will speed up the destruction of old Butte, with its unique cultural history and architecture.

Further, the plant would utilize approximately 20 mw of electricity, which presumably would be generated by the coal-fired generators at Colstrip. Thus, there would be an irreversible loss of coal.

VIII. ECONOMIC BENEFITS

The payroll of workers at the new plant would add about $1 million to the local economy yearly. The workers needed to operate the plant would be as follows:

65 operators

10 laborers

15 maintenance men

10 supervisors

Hiring will be from within the Deer Lodge-Silver Bow County area, although a few supervisory positions may be filled by personnel from elsewhere.

The operation of the plant could be made more profitable if there were a market for gypsum, but at present there is no such market within economical haul distance.

This statement was written by the following persons:

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